

of an important fact in connection with this subject, namely, that when the arc begins to emit the well-known *hissing sound* there is an abrupt change in the opposing electromotive force, which is greater while the arc is silent than when it is hissing.

MM. NACCARI AND PAGLIANI have lately determined the vapour tensions of a number of liquids in the laboratory of the University of Turin. Their method consisted of a modification of that of Regnault, reduction of pressure being effected by an aspirating pump. The tensions of toluene, propylic and isobutylic alcohol, and of several of the ethers of the fatty acids were determined at different temperatures with great exactitude and their empirical formulæ calculated.

FROM a study of the electromotive force of inconstant couples MM. Naccari and Guglielmo conclude that in couples containing one fluid the electromotive force is influenced by the nature of that pole to which the hydrogen goes, and that the change in the strength of the current varies always in the opposite sense to that of the electromotive force, the sense depending upon the manner in which the liberated oxygen enters into secondary chemical actions.

AT the Observatory of Campidoglio, Prof. Respighi has been lately conducting a series of experiments for the determination of gravity. The data are not as yet fully reduced, but the author has described his method (*Atti della R. Acc. dei Lincei*, vol. v. fasc. 5), which consists in the use of a pendulum with a lead ball about $9\frac{1}{2}$ kg. in weight, and a steel wire 0.6 mm. in diameter; a sharp iron point at the extremity, dips in mercury each oscillation, so as to give passage to the current of a chronograph. Five different lengths of pendulum were used, between 7.90 m. and 5.16 m.; and with all these lengths the pendulum, on account of its weight, the fineness of the wire, and the convenient mode of suspension, proved independent of the rotatory motion of the earth, presenting Foucault's well-known phenomenon (an essential condition, in the author's opinion, but not verified in Borda's or Bessel's apparatus). The number and duration of the oscillations were registered by the chronograph with greater exactness than is attainable by the method of coincidences.

AN arrangement for rendering Volta's pile constant and depolarised is described by Count Mocenigo in a recent number of the *Rivista Scientifico-Industriale*. Twelve couples with their elements are fixed on a horizontal axis; a trough of acidulated water having twelve compartments is brought up by a lever motion, so as to cover a good third of the surface of the pile, and a rotatory movement is communicated to the axis.

THE velocity of sound in chlorine has been determined lately by Prof. Tito Martini (*Riv. Sci. Ind.*, No. 6), no physicist having previously, to his knowledge, done so. His method was suggested by an experiment of Tyndall. A glass tube 40 cm. long and 2 cm. internal diameter, and fixed in vertical position, was connected below, by means of a gutta-percha tube, to another glass tube holding sulphuric acid, and capable of being raised or lowered so as to vary the level of the liquid entering the fixed tube, in order to obtain the column of gas which would strengthen a certain tone. The fixed tube was graduated in centimetres and millimetres. Having first verified the accuracy of the method by experiments with carbonic acid and protoxide of nitrogen, the author proceeded to chlorine, and obtained 266.4 m. as mean value of the velocity of sound in it for zero temperature.

THE mode of decomposition of water by discharge of Leyden jars through platinum electrodes has been studied by Dr. Streintz (Vienna Acad. *Ans.*). Riess attributed this phenomena to heating of the electrodes. Using a quadrant-electrometer, &c., Dr. Streintz found that with very small electrodes giving passage to a series of discharge-currents in one direction, then left to themselves, a remarkable reversal of electromotive force occurred, but only when the discharges did not exceed a certain number. The author was led to examine the change of electromotive force by short galvanic currents, which also produce, in a few minutes, a reversal in the electric behaviour of the electrode covered with H_2 ; and he explains this by saying that platinum containing no free, but only occluded, hydrogen is electromotively negative to pure platinum. The further observation that a fully-polarised cell, one of whose electrodes was covered by a very brief galvanic current with H_2 , the other with O_2 , did not show a reversal of the difference of potential, led to the conclusion that the decomposition through battery dis-

charges is to be regarded as the product of a galvanic polarisation and a connected (thermal?) development of oxyhydrogen gas on the two electrodes.

IN a recent note to the Vienna Academy Prof. Reitlinger and Dr. Wächter distinguish three varieties of Lichtenberg figures: (1) the positive radiating figure (*Strahlenfigur*); (2) the positive disk-figure; (3) the negative disk-figure. The (2) was lately added by Herr Holtz. The conditions of production in each case are investigated. The positive radiating figure is produced (according to the authors) by dust particles detached and carried off from the electrode; the negative disk-figure, on the other hand, by gas-discharges. In the former case the particles, while they communicate their positive electricity to the resin, describe radial paths rendered visible and yellow by the dusting process. The reason why one never gets a negative (red) radiating figure, or even branch, is that the electro-negative discharge from a metal or other conductor in air is neither capable of effecting an electric disaggregation of the electrode, nor a carrying away of dust-particles.

To obtain an enlargement (on a screen) variable at will, at any distance, M. Crova (*Journ. de Phys.*, April) places between the object and the screen (which are fixed) a projection-apparatus formed of two lenses, one convergent (plane-convex), the other divergent (plane-concave), of the same focal distance, and capable of being moved apart by means of a rack and pinion arrangement.

GEOGRAPHICAL NOTES

MR. JAMES GLAISHER writes from the office of the Palestine Exploration Fund, announcing the discovery of a "Hittite" City.—"A great battle," he states, "figured in Sir G. Wilkinson's 'Ancient Egyptians,' was fought between Rameses II. and the Hittites near their sacred city of Kadash, which is shown as a city with a double moat, crossed by bridges beside a broad stream running into a lake. The lake has been generally identified with the Baheiret Homs, through which the Orontes passes south of Homs, but the site of the city, as important in Hittite records as the northern capital of Carchemish, remained to be discovered. We now learn from a despatch received from Lieut. Conder, the officer in charge of our new expedition, that he has identified the lost site with the ruins known as the Tell Neby Mendeh. They lie on the left bank of the Orontes, four English miles south of the lake. The modern name belongs to a sacred shrine on the highest part of the hill on which the ruins lie, and the name of Kadesh still survives, so that here is another instance of the vitality of the old names which linger in the minds of the people long after they have forgotten the Roman, Greek, or Crusaders' names. Not only the name is preserved, but the ancient moat of the city itself. Lieut. Conder writes:—'Looking down from the summit of the Tell we appeared to see the very double moat of the Egyptian picture, for while the stream of the Orontes is dammed up so as to form a small lake fifty yards across on the south-east of the site, a fresh brook flows in the west and north to join the river, and an outer line of moat is formed by earthen banks, which flank a sort of aqueduct parallel with the main stream.'

THE French Government is taking advantage of the occupation of a part of Tunis to extend their ordnance survey to regions hitherto untrodden by ordinary travellers. Col. Perrier, the member of the Institute who is at the head of the French Survey, has been ordered for this service.

THE death is announced of Gessi Pasha, the friend and coadjutor of Col. Gordon in the Sudan. He died on the evening of April 30, in the French hospital at Suez, after protracted sufferings caused by the terrible privations he endured in the months of November and December last, when he was shut in by an impassable barrier of weed in the Bahr Gazelle River, Upper Egypt, as already recorded. Capt. Gessi conducted some valuable exploring work on the Nile under Col. Gordon, and in 1876 succeeded in circumnavigating Albert Nyanza, adding greatly to our knowledge of that lake.

IN the *Revue Scientifique* of May 14 M. G. Rolland has a long article on the Sand Dunes of the Sahara, in which he adduces data to show that these dunes shift but very little, that although they move towards the south-east, it is very slowly, and that little difference is made upon them in the course of a generation.

"CAMEOS from the Silver-Land," by Mr. E. W. White, F.Z.S., will shortly be issued in two volumes by Mr. Van Voorst. It relates to the author's experience in the Argentine Republic, and will be specially full on the natural history of the country.

WE regret to learn the death of Admiral La Roncière le Noury, president of the Geographical Society of Paris, who died on Saturday after a protracted illness. He was born in 1813. In 1856 he went to the Arctic Ocean in the *Reine Hortense* on a scientific exploration professedly conducted by Prince Napoleon, who was on board. On the death of M. Chasseloup Laubat the Admiral was elected president of the Paris Society of Geography, in which office he continued without opposition up to the last election. The Admiral took great interest in scientific geography, as well as in zoology and botany.

DR. GERHARD ROHLFS, who has been travelling in Abyssinia, has returned to Berlin.

THE HYPOPHYSAL GLAND IN ASCIDIANS

SINCE the publication of Kowalewsky's remarkable discovery of the course of development in Ascidiæ, and its confirmation, in all the leading features, by Kupffer and others, any morphological work on the Tunicata is naturally regarded with great interest on account of the possibility of its throwing light on the difficult problem of the relationship of that group to the Vertebrata.

Embryological investigations have clearly demonstrated that the fully-formed larval Ascidian (in most genera, at least) possesses an axis occupying the centre of the tail, and comparable with the vertebrate notochord; that the dorsal region of the body contains a neural canal—of epiblastic origin, and formed by the rising up, arching over, and coalescence of "laminae dorsales"—expanding anteriorly as a vesicle, in the walls of which certain sense-organs are developed, and being continued posteriorly as a fine canal running along the tail on the dorsal surface of the notochord. The ventral region of the body is occupied by the alimentary canal, lying below the nerve vesicle, and, in its most posterior prolongation, below the anterior extremity of the notochord, which in this locality separates the neural and visceral canals. These developmental researches have also shown that in the adult Ascidian the branchial aperture must be regarded as homologous with the vertebrate mouth, and the branchial sac with the pharynx.

An excellent paper by M. Charles Julin¹ in the last number of the *Archives de Biologie* (tome ii. fascicule i., 1881), of which a preliminary account appeared lately in the *Bulletin* of the Académie Royale de Belgique (3^{me} ser., t. I, No. 2, Fevr. 1881), adds to this interesting list of homologous organs by showing strong grounds for the belief that the little-understood "neural gland" in the Ascidiæ represents the glandular portion of the hypophysis cerebri, or pituitary body of Vertebrates.

M. Julin gives a minute account of the structure and relations of the peripharyngeal bands, the dorsal lamina, the nerve ganglion, and that enigmatical organ generally known as the olfactory tubercle; the most important section of his paper, however, is that dealing with the neural gland. This structure was first discovered by Hancock, and more recently its glandular nature was demonstrated by Ussow, who called it the olfactory gland, and stated that it was connected with the olfactory tubercle by a narrow canal, an observation since confirmed by Nassonoff. Julin contends that the so-called olfactory tubercle is not a sense-organ at all, but merely the curiously complicated opening into the pharynx of the duct of his "hypophysis." He states that he has been unable to find any nervous connection whatever between the tubercle and the ganglion, and that the nerve which has frequently been observed and described as supplying the supposed sense-organ really passes behind it without communicating, and that therefore he cannot confirm the innervation described and figured by Ussow. The histological structure of the tubercle is also opposed to the probability of its sensory function, as no modified cells are present, the whole surface being covered by normal ciliated columnar epithelium.

The reasons which M. Julin advances in support of the homology of the neural gland with the pituitary body are its structure, its position on the ventral surface of the ganglion, and its rela-

tion with the pharynx. The glandular nature of this body was first shown by Ussow, and its minute structure has been investigated by Julin. It consists of branching glandular tubules surrounded by connective tissue richly supplied with blood-sinuses, while the excretory duct in its posterior part has a complete dorsal wall only, as ventrally it communicates freely with the ends of the tubules, just as is the case with the duct during the development of the pituitary body.

Julin points out that in the Ascidiæ the duct, in running anteriorly towards the olfactory tubercle, is in direct relation with the ventral surface of the nerve ganglion, no layer of connective tissue intervening; and this he states is also the case in Vertebrates.

The position of the neural gland, or "hypophysary gland," as Julin proposes it should be called, is constant. Wherever the nerve-ganglion may be,—and it varies considerably in its position in different species,—the gland is always situated on its ventral surface.

The excretory duct arising from the dorsal surface of the gland, runs anteriorly, directly below the nerve-ganglion, to the olfactory or hypophysary tubercle, where it communicates with the pharynx, probably within the region formed by the epiblast involved in the oral invagination.

It is evident that Julin's observations throw the gravest doubts on the always somewhat questionable olfactory nature of the dorsal tubercle. A ciliated pit having no apparent nervous relations, and connected by a duct with a body having a well-marked glandular structure, has no claim to be regarded as a sense organ. Its function, and that of the gland, remain a mystery; Julin states that he is unable to throw any light upon this question. From the large size of the gland and the constant presence and usually extraordinary complication of the tubercle one would imagine that they performed an important function in the economy of the Ascidian; but what that function is, and why the duct of a gland should have so elaborate an opening into the pharynx, are at present totally unknown.

Julin gives us no information as to the development of these organs. In 1871 Kowalewsky² described, in the course of the development of *Ascidia mammillata*, the formation of an aperture connecting the anterior end of the nerve vesicle with the region of the epiblast which was being invaginated to form the oral funnel, and he declared that this aperture of communication between the neural and visceral canals persisted in the adult as the ciliated tubercle. Kupffer,³ in the following year, while referring to Kowalewsky's statement, declared that he had been unable to discover any such aperture in the larva of *Ascidia mentula*. If Kowalewsky's observation is confirmed, and if the canal is found to remain as the duct of the neural gland, the course of its development would seem to differ considerably from that of the hypophysis cerebri as described by Mihalkovics, Balfour, and Kölliker, which are the views approved of by Julin and confirmed from his own observations.

In conclusion, the arguments in favour of the homology of the Ascidian's neural gland with the glandular portion of the pituitary body are very strong. The structure, position, and relations of the two organs are, in a certain stage of development, identical—admitting, of course, that the branchial sac is a modified pharynx, and that the nerve-ganglion is homologous with the vertebrate brain—and the only point required for the proof of the hypothesis is the demonstration that the neural gland and its duct are epiblastic in formation, and that their development corresponds with that of the pituitary body.

W. A. HERDMAN

STORING OF ELECTRICITY

SECONDARY batteries to store up currents of electricity in the form of chemical work promise to play so important a part in the ultimate adoption of the electric light, that improvements in their construction are of peculiar interest. The latest innovation is due to M. Faure, who has modified with great success the secondary battery of Gaston Planté by covering the surfaces of the lead plates with a coating of minium, thereby increasing their capacity manifold. This device possesses the additional advantage that it obviates the necessity of "forming" the cells by the tedious process of charging and discharging them for many days, as in Planté's batteries. Two sheets of lead are separately coated with minium and are rolled together in a spiral, being kept apart by a layer of felt, and are then placed in a

* "Recherches sur l'Organisation des Ascidiæ simples—sur l'hypophyse et quelques organes qui s'y rattachent dans les genres *Corella*, *Phallusia*, et *Ascidia*." Par Charles Julin, Assistant du Cours d'Embryologie à l'Université de Liège.

¹ "Weitere Studien über die Entwicklung der einfachen Ascidiæ" (*Arch. f. microsc. Anat.*, vol. vii.).

² "Zur Entwicklung der einfachen Ascidiæ" (*Arch. f. microsc. Anat.*, vol. viii. 1872).